DEC STD 179-0 REQUIREMENTS FOR SPECIFYING RAW MATERIALS FOR POWDER-METAL PARTS

DOCUMENT IDENTIFIER: A-DS-EL00179-00-0 Rev C1, 14-Sep-1989

ABSTRACT: This document is a source of information for specifying raw materials intended for use in making powder-metal parts. Attendant material and/or part quality requirements are also included.

APPLICABILITY: This standard is mandatory for defining and identifying powder-metal raw materials on engineering documentation.

STATUS: APPROVED 14-Sep-1989; use VTX SMC for current status.

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Responsible Person:	Richard J. Ceremsak

APPROVAL: This standard has been recommended for approval by the General Review Group for its category.

Richard J. Ceremsak, Standard Owner

Eric Williams, Standards Process Manager

Direct requests for further information to:

Richard J. Ceremsak

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1 INTRODUCTION

1.1 PURPOSE

This standard defines the conventions for identifying powder-metal raw materials on engineering documentation.

1.2 SCOPE

This standard provides references to industry specifications that define sintered powder-metal parts. These parts can be made from any one of many materials and are unique in character. Other aspects of raw materials and/or parts control are also covered in these specifications. They include, but are not limited to, test methods, physical/mechanical properties, process control and inspection. The use of this standard enables the initial selection of raw materials.

1.3 RESPONSIBILITIES

1.3.1 Design Engineering

Design Engineers are responsible for defining raw material on documentation by using the conventions described in main heading 3 of this standard. Design engineers should consult with Advanced Materials and Process Technology (AMPT) if a material identifier cannot be determined.

2 REQUIREMENTS

Final property and quality requirements should be based on the evaluation of prototype parts which are the product of a specific raw material and a given powder-metal manufacturing process as conducted by a specified vendor.

Once the final part requirements have been defined and met, based on actual part evaluation and qualification, subsequent changes in source (vendor), raw material and/or the manufacturing process are prohibited. Such changes also include, but are not limited to, alteration of manufacturing tooling, inspection methods, and process parameters.

Requested changes can be implemented, but must first be approved in writing, with qualifications if needed, by the appropriate Digital design engineering group.

3 MATERIAL IDENTIFIER

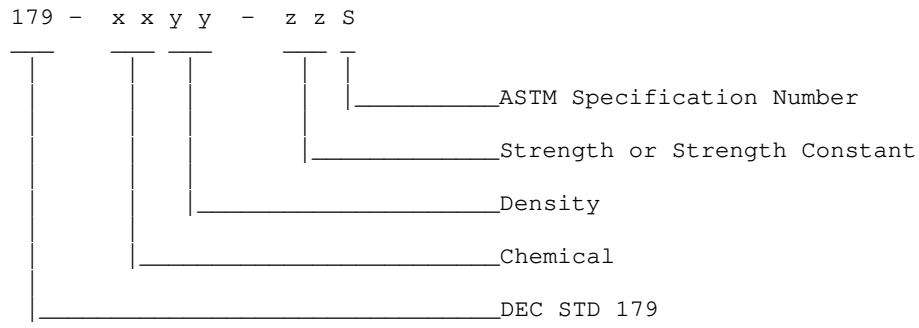
Parts requiring powder-metal materials shall use a 3-4-3 Material Identifier on the engineering drawing. Refer to Figure 1. The Material Identifier specifies the material as powder-metal, and points to the specific ASTM document used for specifying the needed properties.

NOTE

Table 5 lists the applicable ASTM documents by material and intended application.

3.1 FORMAT

The Material Identifier has a 3-4-3 format and is structured as follows:



NOTE

No blank spaces are allowed within this coding.

First three characters - These will always be 179.

Fourth and fifth characters - These designate the material's chemical requirement.

Sixth and seventh characters - These designate the material's density requirements.

Eighth and ninth characters - These designate the material's strength requirements.

Tenth character - The tenth character of the material identifier designates the specific ASTM document that is associated with the raw materials being used. See Table 5 for the appropriate identifier to be used in this character field.

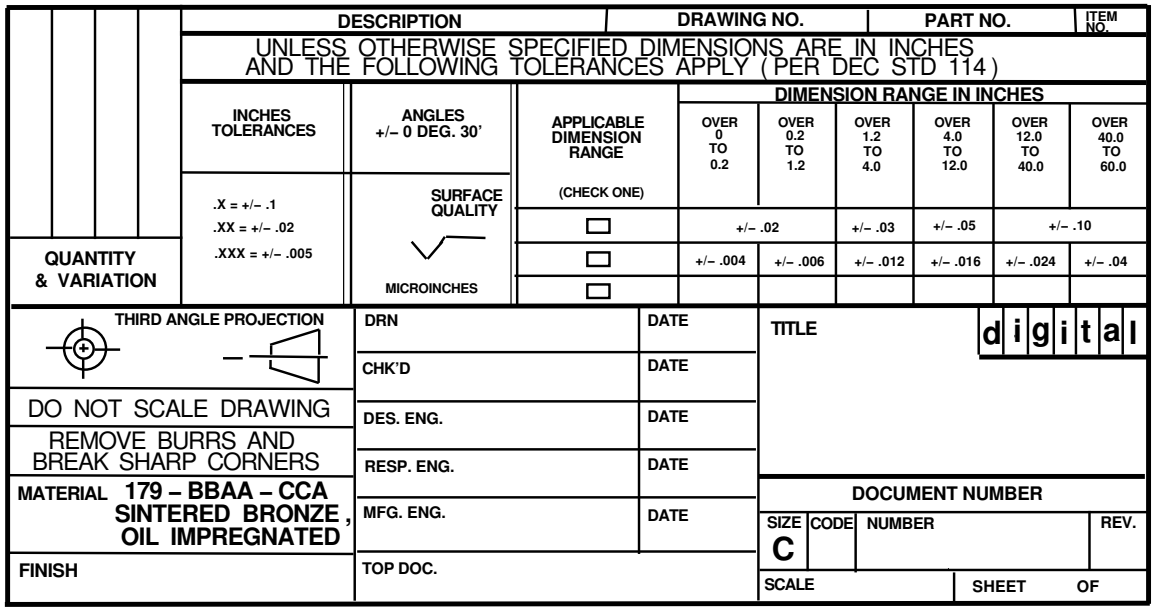
NOTE

The fourth through ninth characters of the material identifier differ according to the material being used.

3.2 USE OF MATERIAL IDENTIFIER

Figure 1 is a sample title block of a part drawing showing placement and use of the 179-class Material Identifier. The design engineer shall place the Material Identifier in the format shown in the drawing title block. A short description of the material shall be placed below the Material Identifier. This description will include the generic material type.

Figure 1: Sample Part Drawing Title Block, Showing Material Identifier



3.3 MATERIAL CODING

The coding for the different materials is described in the following tables.

As an example, Table 1 describes the coding method for a sintered bronze (oil impregnated) material.

Example: 179-BBAA-CCA indicates the following:

(BB) - Chemical Requirement - Grade 1; Class B

(AA) - Density Requirement - Type I; 5.8 to 6.2 g/cm^3

(CC) - Strength Constant - Type III at 30,000 psi

(A) - Applicable ASTM - ASTM B 438

lbf/in^2 (psi) x 6.894 757 E+03 = pascal (N/m^2)

Table 1: Sintered Bronze Bearings (Oil Impregnated) Per ASTM B438 (179-xxyy-zzA)

Chemical Requirements (xx)			Density Requirements (yy)			Strength (K)[1] Constants (zz)		
Code	Grade	Class	Code	Type	g/cm³ Grades 1 and 2	Code	Type	psi Grades 1 and 2
AA	1	A	AA	I	5.8 - 6.2	AA	I	15,000
BB	1	B	BB	II	6.4 - 6.8	BB	II	26,500
CC	2	A	CC	III	6.8 - 7.2	CC	III	30,000
DD	2	B	DD	IV	7.2 - 7.6	DD	IV	34,000

[1]"K" is used to calculate radial crushing force as it is defined in ASTM B438, paragraph 7, Mechanical Properties.

For the "K" value specification to be valid, wall thickness must be less than 1/3 of the outside diameter, per ASTM 438.

Table 2: Iron-Base Sintered Bearings (Oil Impregnated) (179-xxyy-zzB)

Chemical Requirements (xx)		Density Requirements (yy)			Strength (K)[2] Constants (zz)		
Code	Grade	Code	Type	g/cm³	Code	Type	psi
AA	1	AA	1 & 2	5.7 - 6.1	AA	1	25,000
BB	2	BB	3 & 4	5.8 - 6.2	BB	2	30,000
CC	3				CC	3 & 4	40,000
DD	4						

[2]"K" is used to calculate radial crushing force as it is defined in ASTM B439, paragraph 6, Physical Properties

Table 3: Sintered Bronze Structural Parts Per ASTM B255 (179-xxyy-zzC)

Chemical Requirements (xx)		Density Requirements (yy)			Typical Mechanical Properties [3] - Ultimate Tensile Strength - (zz)		
Code	Grade	Code	Type	g/cm³	Code	Density g/cm³	psi
AA	90/10 BRONZE	AA	I	6.4 - 6.8	AA	6.4	13,500
		BB	II	6.8 - 7.2	BB	6.8	16,000
					CC	7.2	20,000

[3]Non-mandatory information - Strength Data was obtained from molded and sintered test specimens rather than from parts.

Table 4: Sintered Austenitic Stainless Steel Structural Parts (179-xxyy-zzD)

Chemical Requirements (xx)		Density Requirements (yy)			Typical Mechanical Properties [1] - Ultimate Tensile Strength - (zz)		
Code	Grade	Code	Type	g/cm³	Code	Type	psi
AA	I (304 SS)	AA	I	6.2 - 6.6	AA	6.4	50,000
BB	II (316 SS)	BB	II	6.6 - 7.0	BB	6.8	63,000
		CC	III	7.0	CC	7.2	77,000

[1]Non-mandatory information - Strength Data was obtained from molded and sintered test specimens rather than from parts.

4 MATERIAL DESIGNATION AND REQUIREMENTS

4.1 CONFORMANCE

All material shall conform to the requirements of the applicable ASTM Specification, latest revision, unless otherwise specified.

4.2 IMPREGNATION

Impregnation shall be by vacuum method, unless otherwise specified.

4.3 ENGINEERING PROPERTIES - SINTERED METALS

The required engineering properties of sintered metal parts shall be based on the successful performance of qualification tests on prototype parts and/or by controlled tests made in a laboratory to establish minimum acceptable property requirements. Required property tests shall be noted on the engineering drawing if not included in the ASTM specification.

5 INSPECTION

The following shall be used as a guideline for inspection requirements:

a. Inspection of powder-metal parts will be as required by the ASTM Specification and the engineering drawing.

b. Permissible variations shall be within limits specified on the engineering drawing.

6 PACKAGING AND SHIPPING

All parts shall be packaged in a manner that will prevent damage and corrosion in handling and transportation. Packaging of oil impregnated parts shall ensure that the oil is not absorbed from the parts by the surrounding material.

7 IDENTIFICATION AND MARKING

Bearings, bushings, and structural parts, except stock items, shall be identified with information specified in DEC STD 178-1 Digital Marking Requirements for Piece Parts. However, this requirement may be waived by the purchaser for reasons such as size, cost, or practicality.

Table 5: ASTM Standards by Material

Material	ASTM Standard [1]	Digital Code (S)	Table Number
Sintered Aluminum Base Structural Parts			
Aluminum	B 595	-	-
Sintered Copper Base Structural Parts			
Copper (electrical)	B 715	-	-
Bronze	B 255	C	3
Brass	B 282	-	-
Nickel Silver	B 458	-	-
Sintered Iron Base Structural Parts			
Carbon Steel	B 310	-	-
Carbon Steel (Copper infiltrated)	B 303	-	-
Iron - Copper	B 222	-	-
Copper - Steel	B 426	-	-
Nickel - Steel	B 484	-	-
Austenitic Stainless Steel	B 525	D	4
Sintered Bearings (Oil Impregnated)			
Bronze	B 438	A	1
Iron Bronze	B 612	-	-
Iron Base	B 439	B	2

[1] The ASTM specifications in this table, not used in this standard, are alternative materials that are available to the design engineer. If the need for a new material becomes imperative, then the design engineer should have it added to this document.

APPENDIX A

REFERENCED DOCUMENTS

A.1 EL-Class Digital Documents

EL-Class Number	Document Title
EL-00178-01	*DEC STD 178-1 Digital Marking Requirements for Piece Parts*

Copies of Digital EL-class documents may be obtained from:

Standards and Methods Control
$ VTX SMC, JOKUR::SMC, DTN: 234-4423, or NRO4/D4

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A.2 ASTM Documents

Document Number	Document Title
B 222	*Standard Specification for Sintered Iron-Copper Structural Parts*
B 255	*Standard Specification for Sintered Bronze Structural Parts*
B 282	*Standard Specification for Sintered Brass Structural Parts*
B 303	*Standard Specification for Copper-Infiltrated Sintered Carbon Steel Structural Parts*
B 310	*Standard Specification for Sintered Carbon Steel Structural Parts*
B 426	*Standard Specification for Sintered Copper-Steel Structural Parts*
B 438	*Standard Specification for Sintered Bronze Bearings (Oil-Impregnated)*
B 439	*Standard Specification for Iron-Base Sintered Bearings (Oil-Impregnated)*
B 458	*Standard Specification for Sintered Nickel Silver Structural Parts*
B 484	*Standard Specification for Sintered Nickel Steel Structural Parts*
B 525	*Standard Specification for Sintered Austenitic Stainless Steel Structural Parts*
B 595	*Standard Specification for Sintered Aluminum Structural Parts*
B 612	*Standard Specification for Iron Bronze Sintered Bearings (Oil-Impregnated)*
B 715	*Standard SPecification for Sintered Copper Structural Parts for Electrical Conductivity Applications*

Copies of ASTM documents may be obtained from:

American Society for Testing and Materials
1916 Race St.
Philadelphia, PA 19103

ASTM documents can also be obtained at/through your local plant library, or through Digital purchasing organizations.

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